Palaeontological Impact Assessment for the proposed FS Farms (Wood Family Trust) upgrade of the water supply, southeast of Warden, Free State Province

Site Visit Report (Phase 2)

For

AquaStrat Solutions (Pty) Ltd

27 November 2022

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Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 33 years research; 25 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by AquaStrat Solutions, Lynwood Ridge, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A Palaeontological Impact Assessment was requested for the proposed upgrading of farm dams, reservoirs and boreholes for agriculture and cattle farming on four farms to the southeast of Warden, Free State Province. The farms are Hill Cottage Farm 290, Cyprus 567, De Villiers 1436 and Elon 674 for - the Wood Family Trust.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit (Phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The farms lie on the Normandien (Estcourt) Formation of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup) and on non-fossiliferous Jurassic dolerite. Rocks of the Adelaide Subgroup could preserve impressions of plants of the *Glossopteris* flora or bones of therapsids, reptiles and parareptiles. The site visit and walk through on 21-22 November 2022 by palaeontologists confirmed that there were no rocky outcrops and no fossils around the dams, reservoirs and boreholes. It is not known what lies beneath the thick soils so a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, developer, environmental officer or other designated responsible person once excavations or drilling activities have commenced. Since the impact will be low to moderate, as far as the palaeontology is concerned, the project should be authorised.

Table of Contents

1. Background

JBW Farming (Pty) Ltd is proposing to increase the water abstraction for agriculture, crops, sheep and cattle, on a cluster of four farms that are located southeast of Warden, Free State Province (Figures 1-2). The farms currently are used for agriculture and livestock and the dams and reservoirs are already in place. They require upgrading by improving the spillovers, the dam wall height or reservoir capacity.

The proposed farms in question and the improvements are listed below

Farm Hill Cottage 390 (Figure 3)
4 dams, 2 reservoirs, 1 windmill
Farm de Villiers 1436 (Figure 4)
1 dam, 2 reservoirs
Farm Elon 674 (Figure 4)
2 dams, 2 reservoirs, 2 boreholes, 1 windmill
Farm Cyprus 567 (Figure 5)
1 dam.

Since the final upgrade may change, each of the sites was surveyed for a radius of 50m or more, so minor changes will not require further assessment for the palaeontological heritage.

A Palaeontological Impact Assessment was requested for the FS Farms (Wood Family Trust), Warden. project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit and walkthrough (Phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

Figure 1: Google Earth map of the proposed development area showing the relevant landmarks.

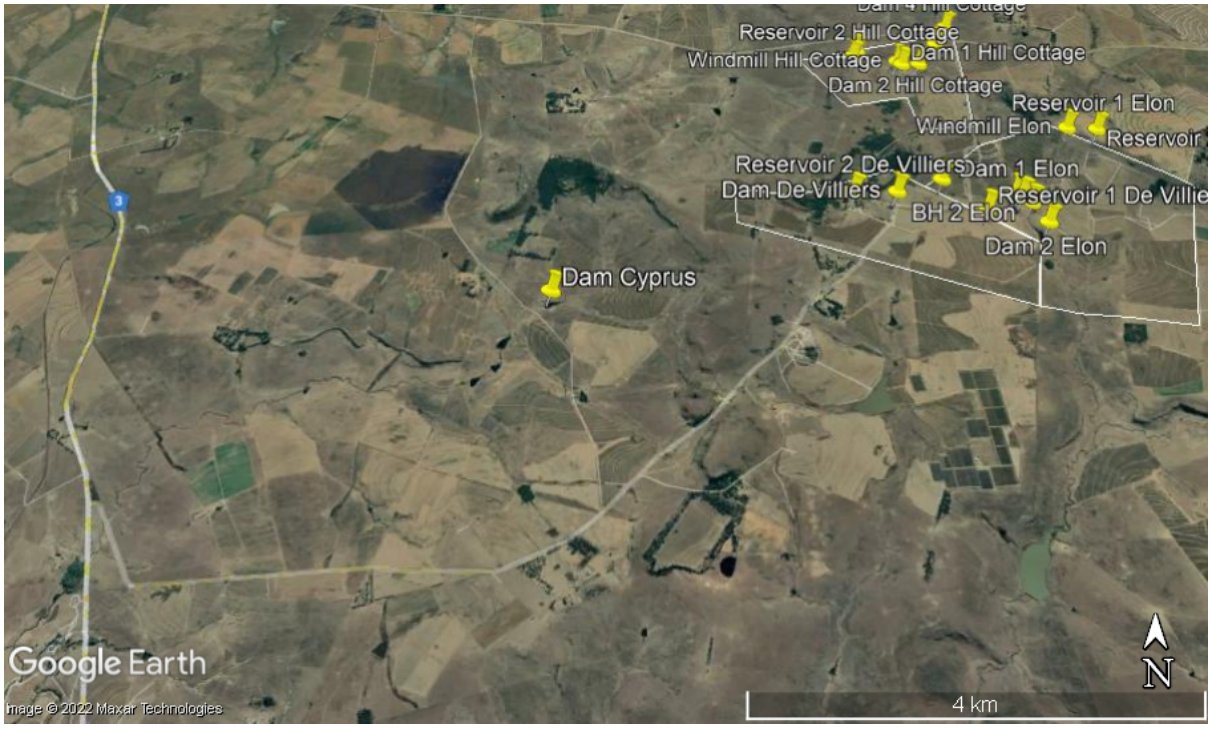

Figure 2: Google Earth map for the farm boundaries of the FS Farms (Wood Family Trust) **water abstraction upgrade, within the red polygon.**

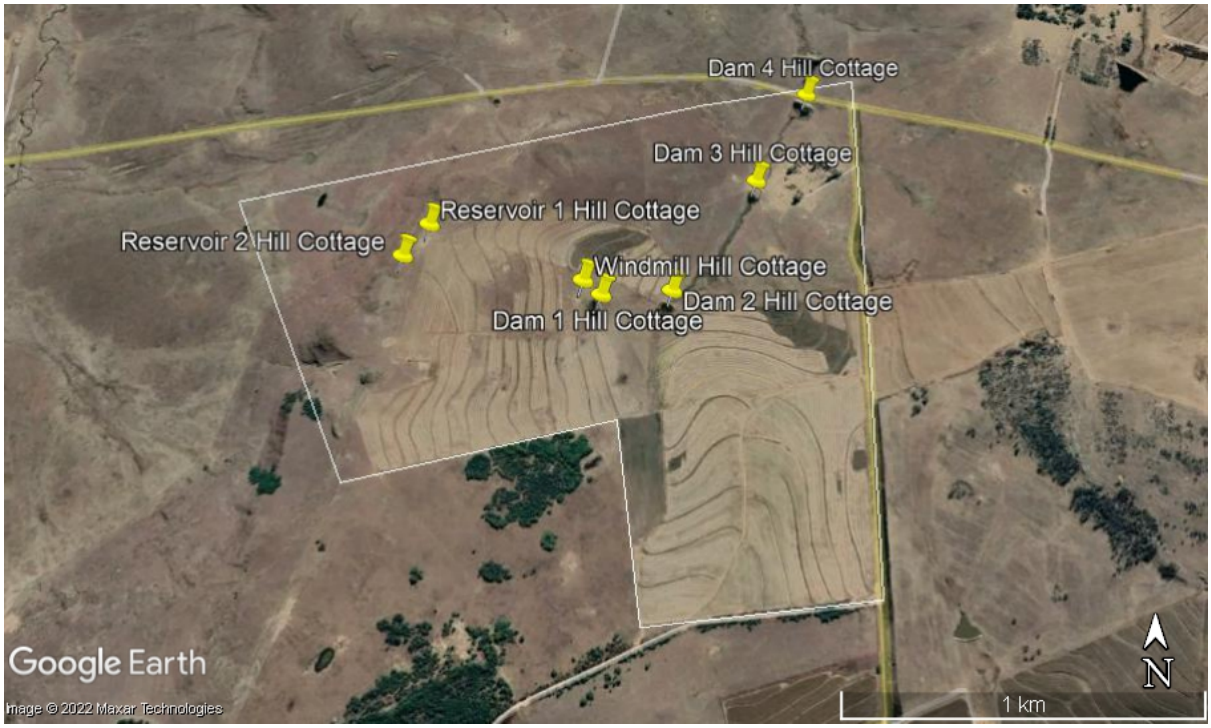

Figure 3: Google Earth map of Farm Hill Cottage 390 with the dams, reservoirs and windmill as marked.

Figure 4: Google Earth map of Farms De Villiers 1436 and Elon 674 with dams, reservoirs and windmills as marked.

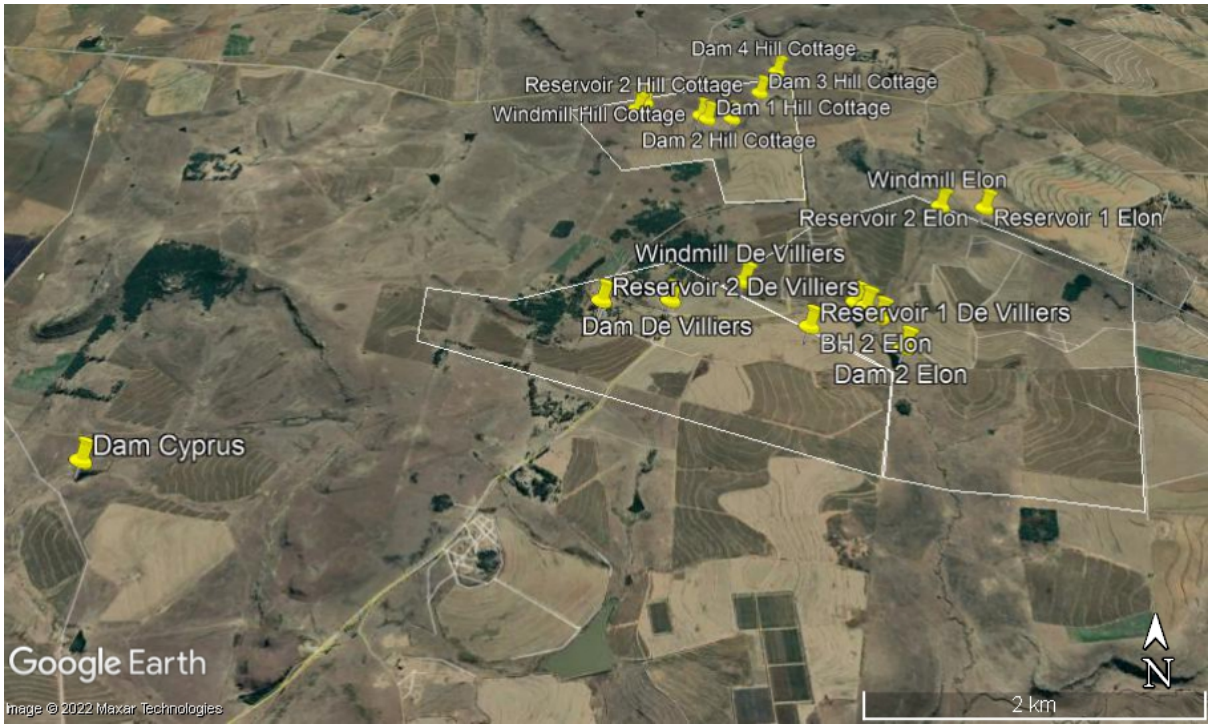

Figure 5: Google Earth map of Farm Cyprus Ptns 1 & 0 with the dam as marked.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance, as is the case here;
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

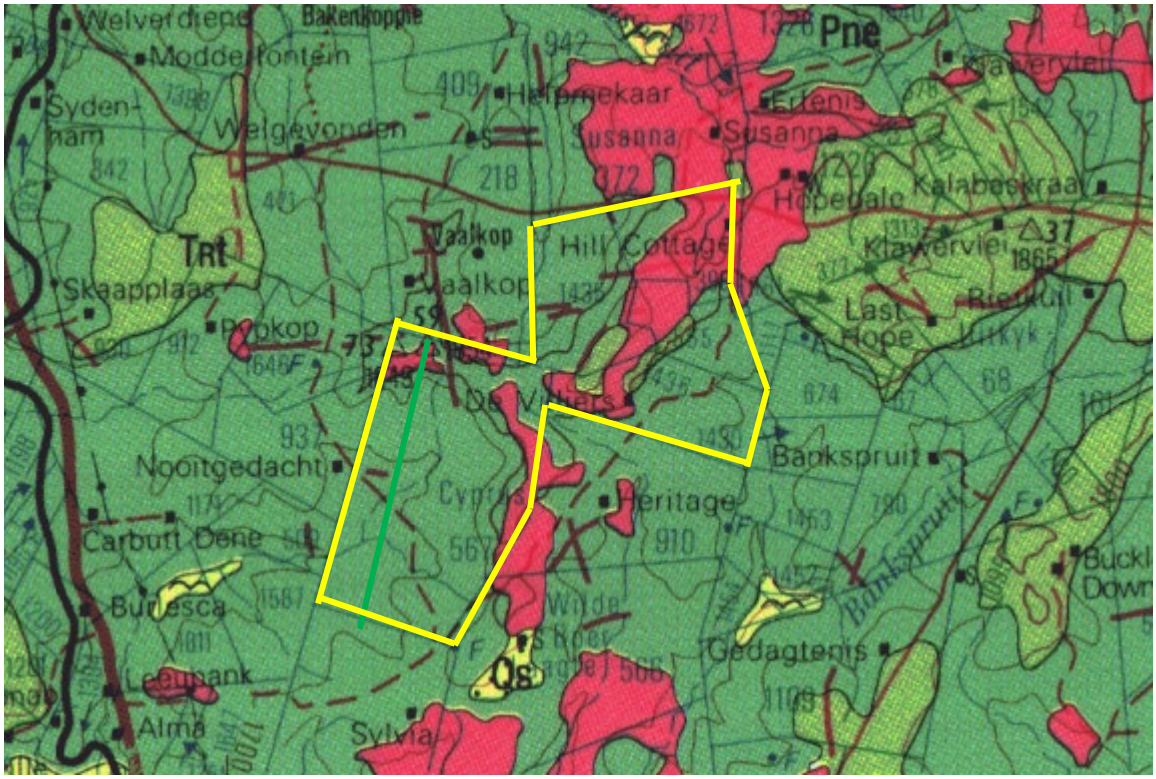

Figure 6: Geological map of the area around the FS Farms (Wood Family Trust)project farms. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2728 Frankfort.

Table 2: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006; Partridge et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qc	Quaternary	Alluvium, sand, calcrete	Quaternary, ca 1.0 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 183 Ma
Trt	Tarkastad Subgroup, Beaufort Group, Karoo SG	Feldspathic sandstone of brown-red mudstone	Early to middle Triassic
Pne	Normandien Fm, Adelaide Subgroup, Beaufort Group, Karoo SG	Blue-grey silty mudstone, subordinate brownish-red mudstone; sandstone	Late Permian

The site lies in the south-central part of the Karoo basin where the middle Karoo Supergroup strata are exposed. Along the rivers and streams much young reworked sands and alluvium overly the older strata (Figure 6).

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and

along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

Overlying the basal Dwyka Group rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. Overlying the Ecca Group are the rocks of the Beaufort Group that has been divided into the lower Adelaide Subgroup for the Upper Permian strata, and the Tarkastad Subgroup for the Early to Middle Triassic strata. As with the older Karoo sediments, the formations vary across the Karoo Basin.

The Adelaide Subgroup in the Free State and KwaZulu Natal in the eastern part of the Karoo Basin the Adelaide Subgroup comprises part of the Volksrust Formation that unconformably underlies the Normandien Formation. Previously known as the Estcourt Formation, the Normandien Formation has been divided into the Frankfort, Rooinekke, Schoondraai and Harrismith Members.

In the Free State and KwaZulu Natal the Tarkastad Subgroup comprises the lower Verkykerskop Formation and upper Driekoppen Formation.

Large exposures of Jurassic dolerite dykes occur throughout the area. These intruded through the Karoo sediments around 183 million years ago at about the same time as the Drakensberg basaltic eruption.

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figures 7-9. The sites for development predominantly are in the Normandien Formation and partly on non-fossiliferous dolerite. The former is very highly sensitive because in other parts of the Karoo Basin the Normandien Formation preserves impressions of leaves of the *Glossopteris* flora. Equivalent aged vertebrate fossils typical of the Daptocephalus Assemblage Zone could occur in these rocks, but not with the fossil plants because different conditions for preservation are required,

The **Normandien Formation** is in the upper part of the Beaufort Group. Previously known as the Estcourt Formation, it has fossil plants of the *Glossopteris* flora (Plumstead, 1969; Anderson and Anderson, 1985; Claassen, 2008; Prevec et al., 2009). This flora includes *Glossopteris* leaves, glossopterid fructifications (*Arberiella* sp*. Eretmonia natalensis, Lidgettonia africana, Lidgettonia lidgettonioides, Lidgettonia* sp.) sphenophytes (*Phyllotheca australis, Sphenophyllum speciosum, Schizoneura africana*), silicified wood of *Agathoxylon* spp. and rare lycopods. Vertebrates are extremely rare in this lithofacies.

The **Balfour Formation** is represented by the *Daptoccephalus* Assemblage Zone
The **Daptocephalus Assemblage Zone** is recognised by the co-occurrence of the dicynodontoid *Daptocephalus leoniceps*, the therocephalian *Theriognathus microps*, and the cynodont *Procynosuchus delaharpeae* (Viglietti, 2020). This has been further divided into two subzones, the lower *Dicynodon -Theriognathus* Subzone (in co-occurrence with *Daptocephalus*), and the upper *Lystrosaurus maccaigi – Moschorhinus kitchingi* Subzone

(ibid). Other taxa include fish, amphibians, parareptiles, eureptiles, biarmosuchians, anomodontians, gorgonopsians, therocephaleans, cynodonts and molluscs. The flora is more diverse than the older Assemblage Zones and comprises glossopterids, mosses, ferns, sphenophytes, lycopods, cordaitaleans and gymnosperm woods (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004).

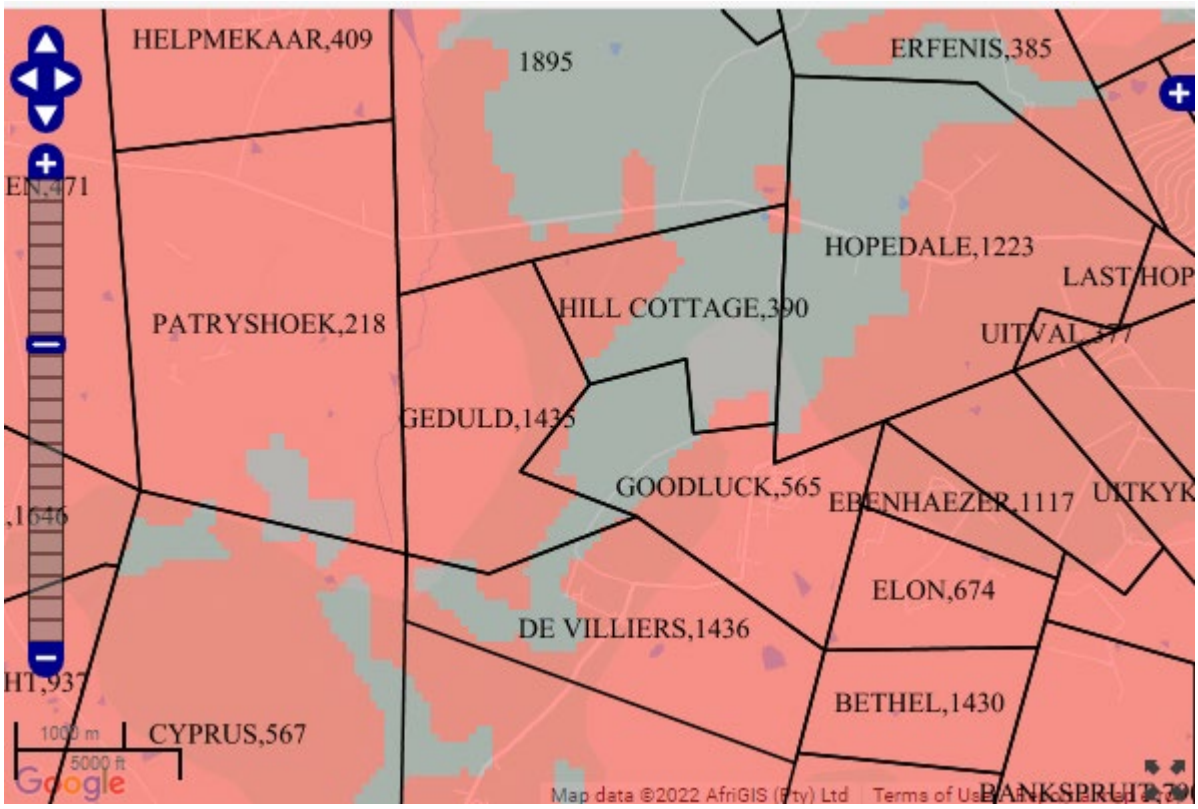

Figure 7: SAHRIS palaeosensitivity map for the site for the proposed water supply upgrade for FS Farms (Wood Family Trust)on Farms De Villiers, Hill Cottage, Elon and Cyprus. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above most of the area is indicated as very highly sensitive (red) for the Normandien Formation and with some areas as having no fossils. Nonetheless, all sites were visited.

iii. Site visit observations

The palaeontologists visited the farms in late November and went to all the pins indicated in Figures 2-5. Details and related site photographs are provided in Table 3. The area has been cultivated for decades and the fields are gently sloping and have no rocks or rocky outcrops. The dams already exist, as do most of the reservoirs and windmills. No fossils were seen on the land surface. The land has deep well-vegetated soils, secondary grasslands and some exotic trees.

Table 3: Site observations, GPS points and relevant figures

Feature & GPS Co-ords	Observations	Figure
Reservoir 1 27° 55' 21.54" S 29° 03' 57.54" E	**Hill Cottage Farm** Small reservoir, leaking water and well-established vegetation all around. Cultivated fields around the site. No rocks and no rocky outcrops.	8A,B
Reservoir 2 27° 55' 25.47" S 29° 03' 57.71" E	As for reservoir 1	8C,D, 9A
Dam 1, Windmill 27° 55' 29.50" S 29° 04' 18.17" E	Small dam with wall of compacted earth, thickly vegetated on top and all around the dam. Dark, muddy clay-rich soils and no rocks or rocky outcrops.	9B, C
Dam 2 27° 55' 28.91" S 29° 04' 26.49" E	As above but larger. Surrounded by ploughed fields.	9D
Dam 3 27° 55' 15.15" S 29° 04' 37.38" E	As above	10A, B
Dam 4 27° 55' 03.08" S 29° 04' 44.77" E	As above. Very wet downstream from the dam wall and partially blocked by gravel road outside the farm boundary	10C,D
Windmill 27° 36' 56.92" S 29° 04' 23.93" E	**De Villiers** Site is a secondary grassland close to already ploughed fields.	11A, B
Dam 27° 56' 44.31" S 29° 04' 02.44" E	Disturbed surrounds with old trees of eucalyptus and black wattle. On dolerite and no fossils.	11C,D
Reservoir 1 27° 56' 52.60" S 29° 04' 18.17" E	Disturbed area, close to outbuildings, parking area, exotic trees vegetation. No rocks and no fossils	12A, D
Reservoir 2 27° 56' 45.43" S 29° 03' 43.03" E	As above. Thick vegetation from leaking reservoir, surrounded by ploughed fields.	
Windmill 27° 56' 09.07" S 29° 05' 26.89" E	**Elon** In secondary grassland with no rocks and no fossils	12C, D
Two reservoirs 27° 56' 10.65" S 29° 05' 39.53" E	Thick grasses and sedges around site. No rocky outcrops and no fossils.	13A-D
Dam 1, borehole 27° 57'45.31" S 29° 04' 57.59" E	Dam with compacted earth wall; thickly vegetated all around. No rocks and no fossils	14A-D
Borehole 2 27° 56' 48.86" S 29° 05' 00.74" E	Thick grassland around. No rocky outcrops	14C, D

Dam 2 27° 56’ 58.87” S 29° 05’ 05.54” E	Rare outcrop of very weathered sandstones; no bones and no plant impressions. Soil profile in a borrow pit shows 50cm of soil overlying coarse sandy and pebbly soils.	15A-D
Dam Cyprus 27° 57’ 31.12” S 29° 01’ 32.59” E	**Cyprus** Large dam in shallow valley with dolerite hill to the south (A). Surrounded by ploughed fields. Thick grasses, sedges and some weeds around the dam. Sandy soil and no rocky outcrops.	16A-D

Figure 8

Figure 9

Figure 10

Figure 11.

Figure 12.

Figure 13.

Figure 14.

Figure 15.

Figure 15.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 4:

Table 4a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 4b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Soils do not preserve plant fossils; so far there are no records from the Normandien Fm of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-

PART B: Assessment		
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be fossil plants from the *Glossopteris* flora in the shales or vertebrate fossils of the Daptocephalus AZ, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	**-**
	M	**-**
	L	No fossils were found on the surface during the walkdown. It is extremely unlikely that any fossils would be found in the soils below the ground because they are already vegetated. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossils. The site visit and walk through confirmed that there were NO FOSSILS in the project footprint. Furthermore, the material to be excavated is soil and this does not preserve fossils. Since there is an extremely small chance that fossils from the Normandien Formation may occur below ground and may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and do contain fossil plant, insect, invertebrate and vertebrate material. The site visit and walk through in late November by palaeontologists confirmed that there are NO FOSSILS on the soil surface and there are no potential fossiliferous rocky outcrops. The soils and sands of the Quaternary period would not preserve fossils.

6. Recommendation

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS of the Normandien Formation flora or fauna of the Daptocephalus Assemblage Zone, even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying

soils and sands of the Quaternary. There is a very small chance that fossils may occur below the ground surface in the shales of the Normandien Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer or other responsible person once excavations and drilling have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

7. References

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8. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations / drilling / mining activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations/mining commence.
2. When excavations begin the rocks and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils, fossils of plants, insects, bone or coalified material) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figures 17-18). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

9. Appendix A – Examples of fossils from the Normandien Formation.

Figure 17: Field photograph of what fossil bones look like, *in situ* and partially exposed.

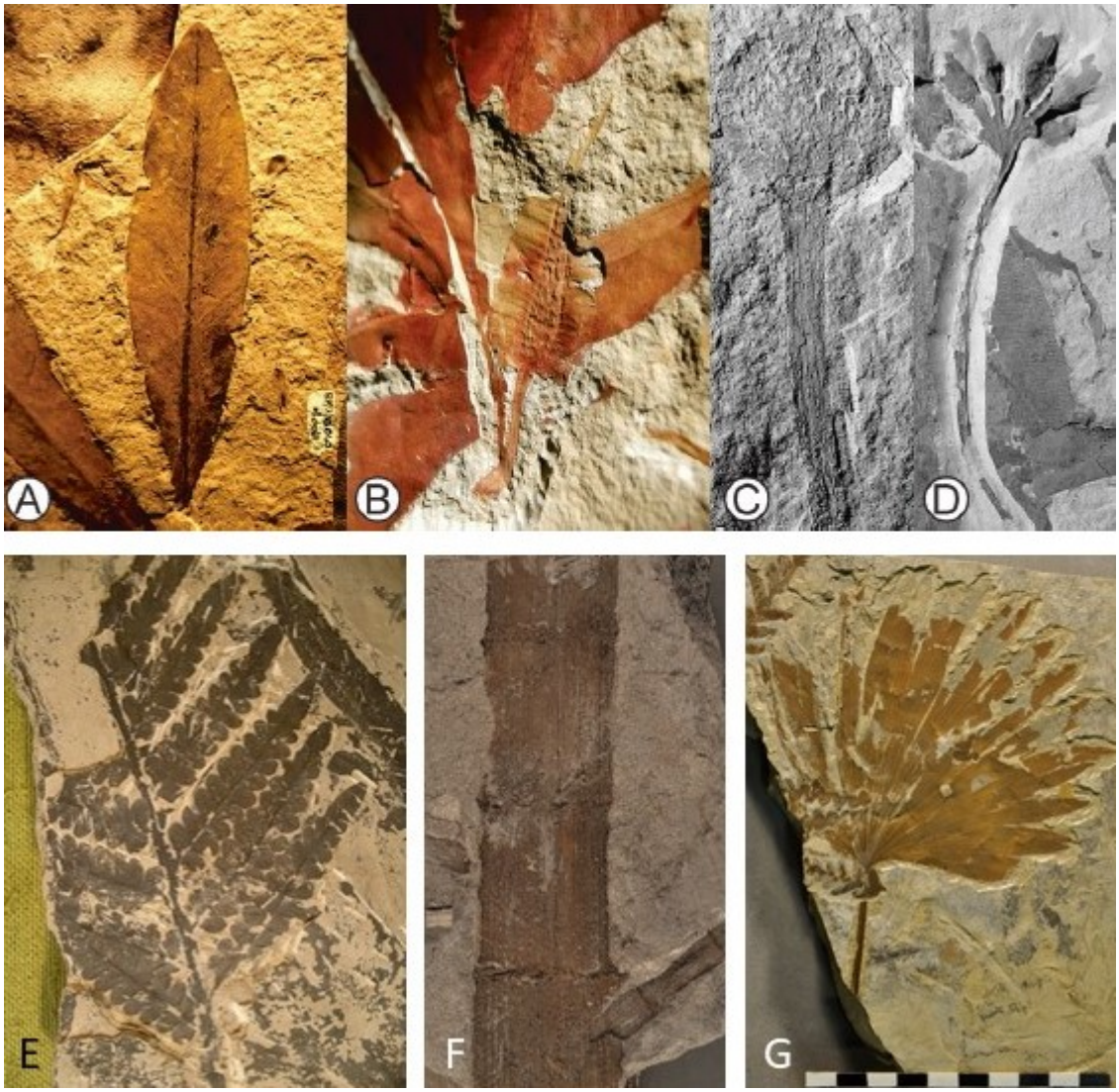

Figure 18: Photographs of fossil plants from the Normandien Formation.

10. Appendix B – Details of specialists

Marion Bamford (PhD)

Short CV for PIAs – July 2022

I) **Personal details**

Present employment: Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa

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Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ;
marionbamford12@gmail.com

ii) **Academic qualifications**
Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) **Professional qualifications**
Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) **Membership of professional bodies/associations**
Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative
ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) **Supervision of Higher Degrees**
All at Wits University

Degree	Graduated/completed	Current
Honours	11	0
Masters	14	1
PhD	11	6
Postdoctoral fellows	12	2

viii) **Undergraduate teaching**
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12 - 20 students per year.

ix) **Editing and reviewing**
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Associate Editor: Cretaceous Research: 2018-2020
Associate Editor: Royal Society Open: 2021 -
Review of manuscripts for ISI-listed journals: 25 local and international journals

x) **Palaeontological Impact Assessments**

Selected from recent project only – list not complete:

- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for Enviropro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for Enviropro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe
- Glosam Mine 2021 for AHSA

Xi) **Research Output**
Publications by M K Bamford up to July 2022 peer-reviewed journals or scholarly books: over 165 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 30; Google Scholar h-index = 36; -i10-index = 95
Conferences: numerous presentations at local and international conferences.

CV of Alisoun Valentine House *November 2022*

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KEY SKILLS AND ATTRIBUTES

- The stamina and ability to work effectively under pressure.
- Highly developed social and interpersonal skills.
- Good communication skills, both oral and written.
- The ability to be creative and innovative and to find workable strategies to achieve stated aims.
- Excellent organisational skills.
- The ability to analyse situations, behaviour and thinking and respond with patience and understanding.
- Research and scientific writing.

WORK HISTORY

Postdoc Fellow – Evolutionary Studies Institute
January 2019 – December 2020
January 2018 – December 2018
January 2017 – December 2020
January 2021 – December 2023 – Honorary Research Associate ESI
Analysis of archaeological charcoal from a Middle Stone Age and Early Iron Age sites
Host: Professor Marion Bamford
Sessional position – School of Animal, Plant and Environmental Sciences
March 2016 – November 2016
Academic support for postgraduate students
Short term internship – University of the Witwatersrand
August – November 2015
Assistant to Editor for 'Flora of the Witwatersrand' – University of the Witwatersrand
September 2008 – February 2010
Assisted with editing and preparing the Flora for publication
Tutor at the College of Science – University of the Witwatersrand
Academic years 2000 – 2003
Responsibilities included teaching general biology to first and second year students in the College of Science; as well as marking essays and assignments.
P.A. to Director/Manager of Cowling Davies (Small Advertising/Design Studio)
April 1992 – December 1992
Responsibilities included reception work; office administration; preparation of quotations; booking media advertisements and general assistance.
Herbarium Technician - University of the Witwatersrand
October 1991 – March 1992
Responsibilities included identification, pressing and mounting of plant specimens; capturing and maintaining data in the Herbarium computer system; maintaining the

collection; filing; acting as librarian for the reference book collection and assisting students with research.

EDUCATION

Doctor of Philosophy (PhD) University of the Witwatersrand (2015)
Title: Systematic Applications of Pollen Grain Morphology and Development in the Acanthaceae
Supervisor: Professor Kevin Balkwill

Master of Science (MSc) University of the Witwatersrand (1991)
Title: A developmental study of *Nephroselmis viridis* (Inouye, Suda et Pienaar) Prasinophyceae
Supervisor: Professor Richard Pienaar
Degree awarded with Distinction.

Bachelor of Science with Honours (B.Sc. Hon.) University of the Witwatersrand (1987)
Awarded the Florence D. Hancock prize for a Dissertation in Phycology (1988)

Higher Diploma in Education (Postgraduate) for Secondary Education University of the Witwatersrand (1985)
Teaching subjects: Biology and Science

Bachelor of Science (B.Sc.) University of Witwatersrand (1984)
Major: Botany
Sub-majors: Microbiology and Zoology

Matriculation Certificate Hyde Park High School (1979)
Subjects passed: English, Afrikaans, Biology, Mathematics, Geography, Home Economics

PUBLICATIONS

Young A.V. and Pienaar R.N. 1989. The ultrastructure of a new species of *Nephroselmis* (Prasinophyceae). Proceedings of the Electron Microscopy Society of Southern Africa. 19: 113–114.

House A. and Balkwill K. 2013. FIB-SEM: An Additional Technique for Investigating Internal Structure of Pollen Walls. Microscopy & Microanalysis 19: 1535–1541.

House A. and Balkwill K. 2014. FIB-SEM: A new technique for investigating pollen walls. Microscopy: advances in scientific research and education (A. Méndez-Vilas, Ed.) 1: 54–58. © FORMATEX.

House A. and Balkwill K. 2016. Labyrinths, columns and cavities: new internal features of pollen grain walls in the Acanthaceae detected by FIB-SEM. Journal of Plant Research 129: 225–240.

House A. and Balkwill K. 2017. FIB-SEM enhances the potential taxonomic significance of internal pollen wall structure at the generic level. Flora-Morphology, Distribution, Functional Ecology of Plants 236–237C: 44–57.

House A. 2017. FIB-SEM: a new method for examining pollen grain walls and palaeontological specimens in 3D. Proceedings of the 21st diennial conference of the South African Society of Quaternary Research. Palaeontologia Africana, 52:21–22. ISSN 2410-4418.

House A. and Balkwill K. 2019. Development and expansion of the pollen wall in *Barleria obtusa* Nees (Acanthaceae). South African Journal of Botany 125: 188–195.

House, A., Bamford, M.K., 2019. Investigating the utilisation of woody plant species at an Early Iron Age site in KwaZulu-Natal, South Africa, by means of identifying archaeological charcoal. Archaeological and Anthropological Sciences 11, 6737-6750. https://doi.org/10.1007/s12520-019-00939-9

House, A., Bamford, M.K., Chikumbirike, J., 2022. Charcoal from Holocene deposits at Wonderwerk Cave, South Africa: A source of palaeoclimate information. Special issue on WW, in Quaternary International 614, 73-63. https://doi.org/10.1016/j.quaint.2020.10.039

Esteban, I., Bamford, M.K., Miller, C.S., Neumann, F.H., Schefuß, E., House, A., Pargeter, J., Cawthra, H., C., Fisher, E.C., in press. Palaeoenvironments of hunter-gatherers from MIS 3 to the Holocene 1 in coastal Pondoland (South Africa): a biochemical and palaeobotanical approach. Quaternary Research..

McCullum DA, House AV, Balkwill K (Eds).The Flora of the Witwatersrand. (Vol. 2). Dicotyledons – Piperaceae to Ebenaceae. NiSC. IN PRESS, (Publishing date-December 2019).

McCullum DA, House AV, Balkwill K (Eds).The Flora of the Witwatersrand. (Vol. 3). Dicotyledons – Oleaceae to Compositae. NiSC IN PRESS, (Publishing date-December 2019).

House A. and Bamford M.K. (in revision). Furnaces, hearths, rituals and construction: investigating the utilisation of woody plant species at an Early Iron Age site by means of identifying archaeological charcoal.

PALAEONTOLOGICAL IMPACT FIELD EXPERIENCE

May 2018 – SARAO Williston and Carnarvon for Digby Wells
August 2019 – Idlanga Coal MR, Rietvlei, Vryheid area – Digby Wells
September 2019 – Schmidtsdrift PR for Thaya Environmental Specialist
September 2019 – Estcourt Pvt Hospital for EnviroPro
September 2019 – Vulindlela BWS for KSEMS
November 2019 – Derseley outfall sewer for Digby Wells

June-Nov 2020 – Frankfort-Windfield 88kV line for Eskom and 1World.
October 2020 – Salene-McCarthy Manganese mine for Prescali
November 2020 – Universal Coal Ubuntu Colliery for HCAC
March 2021 – Doornhoek & Kaspersnek agriculture for Kudzala
July 2021 – Smithfield-Rouxville-Zastron Eskom PL for TheroServ
August 2021 – Dawn Park for iSquare
September 2021 – Hennops River Farm 489 for Archaeological and Heritage Services Africa (Pty) Ltd
November 2021 – Glossam Mine for Archaeological and Heritage Services (Pty) Ltd
February 2022 – Wolf-Skilpad-Grassridge 132 kV OHPL for Zutari.
September 2022 – Highveld SEFs Potchefstroom for CTS
October 2022 – Chemwes SEFs Stilfontein for CTS